

## NOTES ON CLEANUP STANDARDS MEETING – DECEMBER 6, 1995

The working group developing a site-wide groundwater strategy and cleanup standards for RFETS met on Wednesday, December 6, 1995. The meeting was held in T893B at Rocky Flats. The meeting was scheduled for the entire day and was mediated by personnel from Keystone CDPHE, EPA, DOE, Kaiser-Hill and RMRS representatives attended. The attached agenda was loosely followed.

The table with surface water standards, 100 X MCLs and surface water PPRGs was handed out as previously requested. In addition, CDPHE had revised their single text and faxed it out previously (attached). This text was discussed in detail.

### Surficial Soil

The CDPHE proposal action levels included more exposure pathways than were used to calculate the PPRGs. Risk assessors checked these values and agreed to the new numbers.

The attached, 15 mrem/year radiation dose-based surficial soil proposal, which is based on EPA nationwide guidance, was presented (attached). This was immediately challenged by both EPA and CDPHE as it was two orders of magnitude higher than anything previously submitted. The question was raised as to whether this issue should be elevated or if it could be resolved by the group. CDPHE said that they would not buy off on dose-based numbers. EPA said that action levels must be  $10^{-4}$  to  $10^{-6}$  risk based. CDPHE told EPA that they must go to  $10^{-6}$  unless there were mitigating reasons, but EPA disagreed. DOE said that if an ARAR exists, DOE will be quick to adopt it.

As this proposal was a deviation from previous discussions, it was explained that this was not an attempt to spring this on the group. EPA is checking with their HQ to see how soon this proposal will be promulgated. DOE asked if these standards would be considered an ARAR. EPA said that these would be considered, but need not be used. However, EPA usually uses 100 mrem, so 15 mrem is more conservative. Both EPA and CDPHE said that due to insufficient time to review the proposal, this would be the first issue to be elevated.

### Issue 1) Action Level for Rad Cleanup

CDPHE would like to manage all risks above  $10^{-6}$  to the appropriate receptor. This need not be active remediation.

Single text section on Surface Soil - 5.2 B (non rad). Flexibility is built into the  $10^{-6}$  values so that if individual parameters are managed to  $10^{-6}$ , then even if the cumulative risk exceeds  $10^{-6}$ , this will be acceptable. Emphasis is that risk will be managed.

### Subsurface Soils

Agreement was reached that the action level for volatile organics will be the values protective of groundwater at 100x MCL.

The toxicity of air in animal burrows at these values was discussed. Very limited data is available, however, while these data suggest that proposed values may not be protective of animals breathing air in burrows, no animals are currently in the areas in question. CDPHE would like to designate a conservation oversight agency to conduct a case-by-case study of mammals vs. remediation activities.

For all other analytes except volatile organic compounds, within the Industrial Area, construction worker PPRGs will be the action levels. However, dose limits must be analyzed as was done with surficial soils.

The area under the cap is probably sufficiently managed, areas not capped may need institutional control, sources removed, or management control. CDPHE reminds the group that areas not capped must be sufficiently clean for use as an industrial site.

## **Surface Water**

DOE passed out their proposal for surface water (attached) Water should be managed the same as Big Dry Creek segment and assumes that Option B is in-place This way, actual uses will drive the standards

DOE believes that the active phase is the present time as active remediation is taking place Controls are currently in place No one allowed to fish here, and access is controlled

CDPHE and EPA agree that the statement that EPA will manage the buffer zone in the DOE proposal is not germane to the cleanup standards discussion, and request that this be removed

The following points were discussed

- Current Pu influent to A-4/B-5 is around 0.3 pCi/l So if ponds go to flow-through mode, CDPHE proposed standards will be exceeded
- Influent to C-2 can be up to 0.8 pCi/l However, we will take credit for sediment settling due to batch mode release
- Upstream of ponds, 0.15 pCi/l for 30 days will trigger a source evaluation/mitigation as ranked on the prioritization list This includes all upstream reaches of streams, pond B-3, and all ponds influent

General agreement was reached on Page 1 of the handout

Issue 2) Temporary Treatment Facility (TTF) and allowable discharge levels

All groups decided to elevate the issue of discharge from the temporary treatment facility Before a decision is reached, there must be public input and options laid out with basis of estimates, and points of discharge The question was raised that if additional water from the TTF was run through the sewage treatment plant, was this an economical use of the sewage treatment plant? This question is currently being looked at by the engineers on the project

All parties agreed to the non-radiological point of compliance at outfall of terminal ponds Temporary modifications will reflect current conditions However, temporary mods are on Segment 5 only DOE stated that when Option B is in place, Big Dry Stream standards should apply upstream CDPHE felt that the water supply classification will go away, but Vision says water leaving site will be suitable for all uses DOE proposed that during the interim, Big Dry Creek standards will apply At walk-away, drinking water could apply During a discussion about temporary mods, CDPHE indicates that more are not needed, however, DOE leaves the door open for the future

## Interim and Walk-away

Everyone agrees with an exceedance of a 0.15 pCi/l 30-day average as an action level

Interim Stage is achievement of ASAP Two buildings left, areas capped and an active DOE presence remains At Walk-away, Vision is achieved and no DOE presence remains At the start of the Vision period, there will be no more groundwater impact of surface water even though plumes may still be moving through the system DOE stated that by removing sources and high levels, the rest will take care of itself by walk-away CDPHE questioned how it is known that these levels can be achieved RMRS explained that for source removals, design basis and design goals will be set to remediate with this end in mind CDPHE wondered if the framework was being established so as not to do remediation DOE/RMRS assured them that this will not eliminate remediation Framework truly does force remediation

The request was made to delete Indiana Street as the point of compliance

The groundwater working draft of the plume map was displayed CDPHE and EPA felt that this was a very pessimistic view (worst case) EPA's carbon tetrachloride hit map had a much smaller plume CDPHE agreed with the EPA map

### Pond Discharge Goals-Rads

CDPHE wondered why 6 times the current conditions is needed as working space DOE felt that this was guess-work on how ponds will perform in flow-through mode After much discussion, it was agreed that 0.15 pCi/l will be the day-in/day-out standard There will be times that RFETs will exceed these numbers on a limited duration basis These numbers will need refinement CDPHE will provide the language, DOE will provide the numbers based on available data for base flow, storm event (by drainage), peak, medium and averages These will not include TTF numbers Data summaries will then be discussed by watershed by the group This issue will not be elevated as the group can resolve this issues and the Principals will not be required

### Pond Discharge Goals-Non Rads

Action levels will be temporary mods in-place now as these are consistent with stream use Groundwater will be managed to protect surface water So remove the bullet about groundwater cleanup not linked to surface standards

CDPHE stated that the mass balance came about when water plus fish removal as a standard ended up having setting too high of a limit Earlier it was suggested setting temporary standards These would work Mass balance had allowed dilution in stream For example, carbon tetrachloride standard of 35,000 ug/l was created when water and fish was eliminated which is way too high Mass balanced back the Segment 4 values and got a multiplier of 12 "Something happens" to get to 4 which is close to the temporary mod of 18 which stays (See handout)

For 1,1,1 DCE, TCE in segments in stream above terminal ponds 1) calculate values at any of gauging stations in stream where analyte is found above standards, 2) analyze data and 3) apply for and get mod

CDPHE biggest concern is link to groundwater They agree on proposed walk away standards applied downgradient of ponds In interim, decisions made for soil and groundwater will be protective at walk away

This is a major difference between DOE and CDPHE To DOE, surface water is protected in stream when the use of that water is not impacted CDPHE view appears to be that when standards are exceeded near stream (in groundwater), these exceedances must be fixed

CDPHE stated that water and fish is the standard below terminal ponds These values were back calculated to see what was protective on plantsite The most restrictive standard, is back calculated to what is protective in groundwater

DOE inquired about measuring in streams CDPHE was not willing to make leap of diluting groundwater with surface water to meet standards

Agreement was reached that temporary mods will remain in place and will serve as action levels Action limits must be calculated in Segment 5 for additional analytes CDPHE will propose a list of these analytes during the single text rewrite and will simplify the language

Issue 3) Disagree on standards for water and fish vs no water and fish at walk away Aquatic life would apply instead

Issue 4) Action levels for surface water uses Segment 1 standards after option B is in-place vs Segments 4, 5 etc

Issue 5) Point of evaluation vs point of compliance for Rads

Surface Water Tables were provided (see attached)

## **Groundwater**

Review of DOE groundwater proposal (attached) CDPHE asked why state groundwater standards are being abandoned since temporary mods are in-place for most restrictive constituents

EPA and CDPHE debated whether a surface water impact was required in order to take action when groundwater intercepted surface water EPA believes that, consistent with Vision, if surface water not degraded, then why take action? If trying to clean-up problem why bother with no problem? CDPHE believes that using dilution to eliminate a problem is not right DOE feels that if surface water is not degraded, then no action is required CDPHE believes that it has gone as far as it can go The Vision states that groundwater is protected Actions proposed show that groups do not conceptually agree EPA stated that the task was to give standards and technical approach to implement the Vision and this approach meets these requirements

CDPHE does not agree that this approach is consistent with the Vision

Agreement was reached on the Phase 1 MCL times 100 approach and the Monitoring Network

Issue 6) Performance Monitoring point versus POC CDPHE feels that if action levels are exceeded near streams, remediation must be triggered Evaluation and/or management are not acceptable alternatives

CDPHE asked if anyone had considered protecting NRDA resources EPA thought that groundwater should be treated like surface water and if surface water is protected, and since all groundwater daylights, there will be no NRDA damages DOE agreed that if surface water standards aren't exceeded, then we are being protective However, if certain low level contaminated portions of the plumes are not contained, some additional groundwater may become contaminated This should be further explored, but not by this group

The group agreed on using MCLs for Phase 2 wells

However, the group disagreed on the following groundwater issues

- Tier II wells vs monitoring network wells
- Locations to measure impact to surface water by groundwater
- What happens when standards are exceeded

**Action Levels and Water Strategy Task Group**

**wednesday, December 6, 1995  
Rocky Flats, T893b**

**DRAFT AGENDA**

<b>8:30</b>	<b>Discussion of Surface Soil Text</b>
<b>9:30</b>	<b>Discussion of Subsurface Soil Text, including ecological considerations</b>
<b>10 15</b>	<b>Break</b>
<b>10:30</b>	<b>Discussion of Ground Water Text, including Tier III wells</b>
<b>12:00</b>	<b>Lunch</b>
<b>1:00</b>	<b>Discussion of Surface Water Text</b>
<b>2:30</b>	<b>Break</b>
<b>2:45</b>	<b>Discussion of Site-wide Water Strategy (TBC)</b>
<b>4:30</b>	<b>Adjourn</b>

# WATER QUALITY STANDARDS

Chemical	CAS Number	Open Space	MCL x 100	Surface	State Surface Water			
		Surface Water		Water	Standards			
		PPRGs		Site Specific	Water	Water+	Aquatic	Aquatic
		(mg/L)		Standards	Supply	Fish	Acute	Chronic
		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Acenaphthene#	83-32-9	2 04E+03					1 70E+00	5 20E-01
Acenaphthylene#	208-96-8			2 80E-06		2 80E-06		
Acetone#	67-64-1	3 41E+03						
Acrolein	107-02-8						6 80E-02	2 10E-02
Acrylonitrile	107-13-1	-	-	5 80E-05		5 80E-05	7 50E+00	2 60E+00
Alachlor	15972-60-8				2 00E-03			
Aldicarb	116-06-3				3 00E-03			
Aldicarb sulfone	1646-88-4				1 00E-03			
Aldicarb sulfoxide	1646-87-3				4 00E-03			
Aldrin	309-00-2	4 68E-03		1 30E-07	2 00E-06	1 30E-07	1 50E-03	
Aluminum	7429-90-5	9 88E+04					7 50E-01	8 70E-02
Anthracene#	120-12-7	1 02E+04		2 80E-06		9 60E+00		
Antimony	7440-36-0	1 36E+01	6 00E-01		6 00E-03	6 00E-03		
Aroclor-1016	12674-11-2	2 38E+00	5 00E-02	4 40E-08	5 00E-06	4 40E-08	2 00E-03	1 40E-05
Aroclor-1221	11104-28-2	1 03E-02	5 00E-02	4 40E-08	5 00E-06	4 40E-08	2 00E-03	1 40E-05
Aroclor-1232	11141-16-5	1 03E-02	5 00E-02	4 40E-08	5 00E-06	4 40E-08	2 00E-03	1 40E-05
Aroclor-1242	53469-21-9	1 03E-02	5 00E-02	4 40E-08	5 00E-06	4 40E-08	2 00E-03	1 40E-05
Aroclor-1248	12672-29-6	1 03E-02	5 00E-02	4 40E-08	5 00E-06	4 40E-08	2 00E-03	1 40E-05
Aroclor-1254	11097-69-1	1 03E-02	5 00E-02	4 40E-08	5 00E-06	4 40E-08	2 00E-03	1 40E-05
Aroclor-1260	11096-82-5	1 03E-02	5 00E-02	4 40E-08	5 00E-06	4 40E-08	2 00E-03	1 40E-05
Arsenic	7440-38-2	4 54E-02	5 00E+00		5 00E-02		3 60E-01	1 50E-01
Atrazine	1912-24-9	-	-	3 00E-03	3 00E-03			
Barium	7440-39-3	2 38E+03	2 00E+02		1 00E+00			
Benzene#	71-43-2	2 74E+00	5 00E-01		1 00E-03	1 00E-03	5 30E+00	
Benzidine	92-87-5	-	-	1 20E-07	2 00E-07	1 20E-07	2 50E+00	
alpha-BHC	319-84-6	1 26E-02					1 00E-01	
beta-BHC	319-85-7	4 42E-02					1 00E-01	
delta-BHC	319-86-8	-					1 00E-01	
gamma-BHC (Lindane)	58-89-9	6 11E-02					1 00E-01	
Benzo(a)anthracene	56-55-3	1 09E-01		2 80E-06		4 40E-06		
Benzo(a)pyrene	50-32-8	1 09E-02	2 00E-02	2 80E-06		4 40E-06		
Benzo(b)fluoranthene	205-99-2	1 09E-01		2 80E-06		4 40E-06		
Benzo(g,h,i)perylene	191-24-2	-		2 80E-06		4 40E-06		
Benzo(k)fluoranthene	207-08-9	1 09E+00		2 80E-06		4 40E-06		
Benzoic Acid	65-85-0	1 36E+05						
Benzyl Alcohol	100-51-6	1 02E+04						
Beryllium	7440-41-7	1 85E-02	4 00E-01					
bis(2-Chloroethoxy)methane#	111-91-1	-			4 00E-03			
bis(2-Chloroethyl)ether#	111-44-4	7 23E-02		3 00E-05	3 00E-05	3 00E-05		
bis(2-Chloroisopropyl)ether#	108-60-1	1 14E+00				1 40E+00		
bis(Chloromethyl)ether				3 70E-09				
bis(2-Ethylhexyl)phthalate	117-81-7	5 68E+00	6 00E-01			1 80E-03		
Bromodichloromethane#	75-27-4	1 28E+00	1 00E+01	3 00E-04			1 10E+01	
Bromoform#	75-25-2	1 01E+01	1 00E+01	4 00E-03				
Bromomethane#	74-83-9	4 77E+01						
4-Bromophenyl phenyl ether	101-55-3	-						
2-Butanone#	78-93-3	2 04E+04						

# WATER QUALITY STANDARDS

Chemical	CAS Number	Open Space	MCL x 100	Surface Water		State Surface Water Standards			
		Surface Water		Site Specific		Water Supply	Water+ Fish	Aquatic Acute	Aquatic Chronic
		PPRGs		Standards		(mg/L)	(mg/L)	(mg/L)	(mg/L)
		(mg/L)		(mg/L)		(mg/L)	(mg/L)	(mg/L)	(mg/L)
Butylbenzylphthalate	85-68-7	6 81E+03					3 00E+00		
Cadmium	7440-43-9	1 70E+01	5 00E-01			5 00E-03			
Calcium	7440-70-2	-							
Carbofuran	1563-66-2	-	4 00E+00			3 60E-02			
Carbon disulfide#	75-15-0	3 41E+03							
Carbon tetrachloride#	56-23-5	6 11E-01	5 00E-01	1 80E-02	a	3 00E-04	2 50E-04	3 52E+01	
Cesium	7440-46-2	-							
alpha-Chlordane	5103-71-9	6 11E-02	2 00E-01	5 80E-07		3 00E-05	5 80E-07	1 20E-03	4 30E-06
beta-Chlordane	5103-74-2	6 11E-02	2 00E-01	5 80E-07		3 00E-05	5 80E-07	1 20E-03	4 30E-06
gamma-Chlordane	5103-74-2	6 11E-02	2 00E-01	5 80E-07		3 00E-05	5 80E-07	1 20E-03	4 30E-06
4-Chloroaniline	106-47-8	1 36E+02							
Chlorobenzene#	108-90-7	6 81E+02	1 00E+01			1 00E-01	1 00E-01		
Chloroethane#	75-00-3								
Chloroform#	67-66-3	1 30E+01	1 00E+01	6 00E-03				2 89E+01	1 24E+00
Chloromethane#	74-87-3	6 11E+00		5 70E-03			5 70E-03		
4-Chloro-3-methylphenol	59-50-7	-						3 00E-02	
2-Chloronaphthalene#	91-58-7	2 73E+03						2 30E+00	6 20E-01
2-Chlorophenol#	95-57-8	1 70E+02		2 00E+00			1 20E-01	4 38E+00	2 00E+00
4-Chlorophenyl phenyl ether	7005-72-3	-							
Chloropyrifos	2921-88-2							8 30E-05	4 10E-05
Chromium (Total)	7440-47-3	-	1 00E+01						
Chromium III	7440-47-3	3 41E+04	-			5 00E-02			
Chromium VI	7440-47-3	1 70E+02	-			5 00E-02			
Chrysene	218-01-9	1 09E+01		2 80E-06			4 40E-06		
Cobalt	7440-48-4	2 04E+03							
Copper	7440-50-8	1 36E+03		2 30E-02	a	1 00E+00			
Cyanide	57-12-5	6 81E+02	2 00E+01						
4 4-DDD	72-54-8	3 31E-01					8 30E-07	6 00E-04	
4 4-DDE	72-55-9	2 34E-01				1 00E-04	5 90E-07	1 05E+00	
4 4-DDT	50-29-3	2 34E-01		5 90E-07		1 00E-04	5 90E-07	5 50E-04	1 00E-06
Dalapon	75-99-0					2 00E-01			
Demeton	8065-48-3			1 00E-04				1 00E-04	
Dibenz(a,h)anthracene	50-70-3	1 09E-02		2 80E-06			4 40E-06		
Dibenzofuran	132-64-9								
Dibromochloromethane	124-48-1	9 46E-01		6 00E-03					
1 2-Dibromo-3-chloropropane	96-12-8					2 00E-04			
Di-n-butylphthalate	84-74-0	3 41E+03							
2 4 D	94-75-7			7 00E-02		7 00E-02			
1 2-Dichlorobenzene#	95-50-1	3 07E+03	6 00E+01			6 20E-01	6 20E-01		
1 3-Dichlorobenzene#	541-73-1	-	6 00E+01			6 20E-01	4 00E-01		
1 4-Dichlorobenzene#	106-46-7	3 31E+00	7 50E+00			7 50E-02	7 50E-02		
3 3-Dichlorobenzidine	91-94-1	1 77E-01		3 90E-05			3 90E-05		
1 1-Dichloroethane#	107-06-2	3 41E+03							
1 2-Dichloroethane#	107-06-2	8 74E-01	5 00E-01			4 00E-03	4 00E-03	1 18E+02	2 00E+01
1 1-Dichloroethene#	540-59-0	1 32E-01	7 00E-01			7 00E-03	5 70E-05		
1 2-Dichloroethene (total)#	540-59-0	3 07E+02	7 00E+00			7 00E-02	1 00E-01		
2 4-Dichlorophenol	120-83-2	1 02E+02				2 10E-02	2 10E-02	2 02E+00	3 65E-01
1 2-Dichloropropane#	78-87-5	1 17E+00	5 00E-01			5 60E-04	5 60E-04	2 30E+01	5 70E+00
cis-1 3-Dichloropropene#	1006-01-5	4 42E-01					1 00E-02	6 06E+00	2 44E-01

# WATER QUALITY STANDARDS

Chemical	CAS Number	Open Space	MCL x 100	Surface Water	State Surface Water Standards			
		Surface Water		Site Specific	Water Supply	Water+ Fish	Aquatic Acute	Aquatic Chronic
		PPRGs (mg/L)		Standards (mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
trans-1 3-Dichloropropene#	10061-02-6	4 42E-01				1 00E-02	6 06E+00	2 44E-01
Dieldrin	60-57-1	4 97E-03		1 40E-07	2 00E-06	1 40E-07	1 30E-03	1 90E-06
Diethylphthalate	84-66-2	2 73E+04				2 30E+01		
2 4-Dimethylphenol#	105-67-9	6 81E+02				5 40E-01	2 12E+00	
Dimethylphthalate	131-11-3	3 41E+05				3 13E+02		
4 6-Dinitro-2-methylphenol#	534-52-1							
2 4-Dinitrophenol	51-28-5	6 81E+01			1 40E-02	1 40E-02		
2 4-Dinitrotoluene	121-14-2	6 81E+01				1 10E-04		
2 6-Dinitrotoluene	606-20-2	1 17E-01					3 30E-02	2 30E-02
Di-n-octylphthalate	117-84-0	5 68E+00						
Dioxin	1746-01-6	-	3 00E-06	1 30E-11	2 20E-10	1 30E-11	1 00E-05	1 00E-08
Diquat	85-00-7	-	2 00E+00		2 00E-02			
Endosulfan I	959-98-8	2 04E+02		5 60E-05			1 10E-04	5 60E-05
Endosulfan II	33213-65-9	2 04E+02		5 60E-05			1 10E-04	5 60E-05
Endosulfan sulfate	1031-07-8	2 04E+02		5 60E-05		1 10E-01		
Endosulfan (technical)	115-29-7	2 04E+02		5 60E-05			1 10E-04	5 60E-05
Endothal	145-73-3		1 00E+01		1 00E-01			
Endrin ketone	53494-70-5	-						
Endrin (technical)	72-20-8	1 02E+01	2 00E-01	2 30E-06	2 00E-03		9 00E-05	2 30E-06
Ethylbenzene#	100-41-4	3 41E+03	7 00E+01		6 80E-01	6 80E-01	3 20E+01	
Ethylene dibromide	106-93-4		5 00E-03		5 00E-05			
Fluoranthene	206-44-0	1 36E+03		4 20E-02		3 00E-01	3 98E+00	
Fluorene#	86-73-7	1 36E+03		2 80E-06		1 30E+00		
Glyphosate	1071-83-6				7 00E-01			
Guthion	86-50-0			1 00E-05				1 00E-05
Heptachlor	76-44-8	1 77E-02	4 00E-02	2 10E-07	8 00E-06	2 10E-07	2 60E-04	3 80E-06
Heptachlor epoxide	1024-57-3	8 74E-03	2 00E-02		4 00E-06	1 00E-07	2 60E-04	3 80E-06
Hexachlorobenzene	118-74-1	4 97E-02	4 97E-02	7 20E-07	1 00E-03	7 50E-07		
Hexachlorobutadiene	87-68-3	1 02E+00		4 50E-04	1 00E-03	4 50E-04	9 00E-02	9 30E-03
Hexachlorocyclohexane alpha	319-84-6			3 90E-06	6 00E-06	3 90E-06		
Hexachlorocyclohexane beta	319-85-7			1 40E-05		1 40E-05		
Hexachlorocyclohexane gamma	58-89-9		2 00E-02	1 90E-05	2 00E-04	1 90E-05	1 00E-03	8 00E-05
Hexachlorocyclohexane(technical)	608-73-1			1 20E-05		1 20E-05		
Hexachlorocyclopentadiene	77-47-4	2 38E+02	5 00E+00		5 00E-02	5 00E-02	7 00E-03	5 00E-03
Hexachloroethane	67-72-1	5 68E+00		1 90E-03		1 90E-03	9 80E-01	5 40E-01
2-Hexanone#	591-78-6	-						
Indeno(1 2 3-cd)pyrene	193-39-5	1 09E-01		2 80E-06		4 40E-06		
Iron	7439-89-6	-		1 32E+01	a 3 00E-01			1 00E+00
Isophorone	78-59-1	8 37E+01			4 00E-02	3 60E-02	1 17E+02	
Lead	7439-92-1	-		2 80E-02	a 5 00E-02			
Lindane	58-89-9	-	2 00E-02					
Lithium	7439-93-2	6 81E+02						
Magnesium	7439-95-4							
Malathion	121-75-4	-		1 00E-04				1 00E-04
Manganese	7439-96-5	1 70E+02		5 60E-01	a b 5 00E-02			1 00E+00
Mercury	7439-97-6	1 02E+01	2 00E-01		2 00E-03		2 40E-03	1 00E-04
Methoxychlor	72-43-5	1 70E+02	4 00E+00	3 00E-05	4 00E-02			3 00E-05
Methylbromide	74-83-9			4 80E-02		4 80E-02		



# WATER QUALITY STANDARDS

Chemical	CAS Number	Open Space	MCL x 100	Surface Water	State Surface Water Standards			
		Surface Water		Site Specific	Water Supply	Water+ Fish	Aquatic Acute	Aquatic Chronic
		PPRGs (mg/L)		Standards (mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Methylene chloride#	75-09-2	1 06E+01	5 00E-01	4 70E-03	5 00E-03	5 00E-03		
2-Methylnaphthalene#	91-57-6	-						
4-Methyl-2-pentanone#	108-10-1	2 73E+03						
2-Methylphenol	95-48-7	1 70E+03						
4-Methylphenol	106-44-5	-						
Mirex	2385-85-5	-		1 00E-06				1 00E-06
Molybdenum	7439-98-7	1 70E+02						
Naphthalene#	91-20-3	1 36E+03		2 80E-06			2 30E+00	6 20E-01
Nickel	7440-02-0	6 81E+02	1 00E+01		1 00E-01			
2-Nitroaniline	88-74-4	-						
3-Nitroaniline	99-09-2	-						
4-Nitroaniline	100-01-6	-						
Nitrobenzene#	98-95-3	1 70E+01			3 50E-03	3 50E-03	2 70E+01	
2-Nitrophenol	88-75-5							
4-Nitrophenol#	100-02-7	-						
n-Nitrosodibutylamine				6 40E-06		6 40E-06		
n-Nitrosodiethylamine				8 00E-07		8 00E-07		
n-Nitrosodimethylamine	62-75-9			6 90E-07		6 90E-07		
n-Nitrosodiphenylamine#	86-30-6	1 62E+01		4 90E-03		5 00E-03		
n-Nitrosodipropylamine	621-64-7	1 14E-02				5 00E-06		
n-Nitrosopyrrolidine				1 60E-05		1 60E-05		
Oxymyl	23135-22-0	-	2 00E+01		2 00E-01			
Parathion				4 00E-04				
Pentachlorophenol	87-86-5	6 62E-01	1 00E-01		1 00E-03	2 80E-04	9 00E-03	5 70E-03
Phenanthrene#	85-01-8	-		2 80E-06		2 80E-06		
Phenol	108-95-2	2 04E+04					1 02E+01	2 56E+00
Potassium	7440-09-7	-						
Pyrene	129-00-0	1 02E+03		2 80E-06		9 60E-01		
Selenium	7782-49-2	1 70E+02	5 00E+00		5 00E-02		1 35E-01	1 70E-02
Silver	7440-22-4	1 70E+02			1 00E-01			
Simazine	122-34-9	-	4 00E-01	4 00E-03	4 00E-03			
Sodium	7440-23-5	-						
Strontium	7440-24-6	2 04E+04						
Stryene#	100-42-5	6 81E+03	1 00E+01		1 00E-01			
Tetrachloroethane				7 60E-02				
1,1 2 2-Tetrachloroethane#	79-34-5	3 97E-01		1 70E-04		1 70E-04		2 40E+00
Tetrachloroethene#	127-18-4	1 53E+00	5 00E-01	8 00E-04	5 00E-03	8 00E-04	5 28E+00	8 40E-01
Thallium	7440-28-0	-	2 00E-01		5 00E-04	5 00E-04		1 50E-02
Tin	7440-31-5	2 04E+04						
Toluene#	108-88-3	6 81E+03	1 00E+02		1 00E+00	1 00E+00	1 75E+01	
Toxaphene	8001-35-2	7 23E-02	3 00E-01	2 00E-07	3 00E-05		7 30E-04	2 00E-07
1 2 4-Trichlorobenzene#	120-82-1	3 41E+02	7 00E+00		7 00E-02		2 50E-01	5 00E-02
1 1 1-Trichloroethane#	71-55-6	-	2 00E+01		2 00E-01	2 00E-01		
1 1 2-Trichloroethane#	79-00-5	1 39E+00	5 00E-01	6 00E-04	3 00E-03	6 00E-04	9 40E+00	
Trichloroethene#	79-01-6	7 23E+00	5 00E-01	6 60E-02	5 00E-03	2 70E-03	4 50E+01	2 19E+01
2 4 5-Trichlorophenol	95-95-4	3 41E+03						
2 4 6-Trichlorophenol	88-06-2	7 23E+00		2 00E-03	2 00E-03	2 00E-03		9 70E-01
Vanadium	7440-62-2	2 38E+02						
Vinyl acetate	108-05-4	-						

# WATER QUALITY STANDARDS

		Open Space		Surface		State Surface Water			
				Water		Standards			
	CAS	Surface Water	MCL x 100	Site Specific		Water	Water+	Aquatic	Aquatic
	Number	PPRGs		Standards		Supply	Fish	Acute	Chronic
Chemical		(mg/L)	(mg/L)	(mg/L)		(mg/L)	(mg/L)	(mg/L)	(mg/L)
Vinyl chloride#	75-01-4	4 18E-02	2 00E-01			2 00E-03	2 00E-03		
Xylene (total)#	1330-20-7	6 81E+04	1 00E+03			1 00E+01			
Zinc	7440-66-6	1 02E+04		3 50E-01		5 00E+00			
		-							
Nitrate	1-005	5 45E+04	1 00E+03						
Nitrite	1-005	3 41E+03							
Sulfide	18496-25-8	-							
		-							
Ammonium	7664-41-7	-							
Bicarbonate	71-52-3	-							
Bromide	7726-95-6	-							
Carbonate	3812-32-8	-							
Chloride	16887-00-6	-							
Fluoride	16984-48-8	2 04E+03	4 00E+02						
Orthophosphate	14265-44-2	-							
Silica (as Si and SiO <sub>2</sub> )	7631-86-9	-							
Sulfate	14808-79-8	-	5 00E+04						
		(pCi/L)							
Americium-241	14596-10-2	1 36E+02		5 00E-02					
Cesium-137+D	10045-97-3	1 41E+03							
Plutonium-239	10-12-8	1 41E+02		5 00E-02					
Plutonium-240	10-12-8	1 41E+02		5 00E-02					
Radium-226+D	13982-63-3	1 50E+02	2 00E+00						
Radium-228+D	15262-20-1	1 79E+02	2 00E+00						
Strontium-89	11-10-9	4 31E+03							
Strontium-90+D	11-10-9	7 95E+02							
Tritium	10028-17-8	6 22E+05		5 00E+02					
Uranium-233+D	11-08-5	2 78E+03		5 00E+00					
Uranium-234 )	11-08-5	1 00E+03		5 00E+00					
Uranium-235+D	15117-96-1	9 46E+02		5 00E+00					
Uranium-238+D	7440-61-1	7 17E+02		5 00E+00					
a) Temporary modifications									
b) Dissolved									
# = Chemicals listed are volatile									

# **Rocky Flats Environmental Technology Site**

## **Action Level Framework for Surface Water, Ground Water, and Soils**

(12/5/95)

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## **1 0 General Background**

### **1.1 Goal of Action Level Framework at RFETS**

On October 10 and 11, 1995, a "Workout Session" was convened between DOE, EPA, CDPHE, DNFSB, and Kaiser-Hill to resolve, or develop a path to resolve, all outstanding issues associated with the new Rocky Flats Cleanup Agreement (RFCA). Several of the significant Workout Session outcomes include agreement on a conceptual vision of the end-state of RFETS after closure and cleanup, and agreement that the environmental cleanup of the site will now be implemented through a "carve-out" approach. The conceptual vision designated the approximate areal extent of four future land uses. These include capped areas underlain by either waste disposal cells or contaminated materials closed in-place, an industrial area, an inner buffer zone managed as open space, and an uncontaminated outer buffer zone that, while it will be managed as open space, actually could be used for any use. The carve-out will be implemented such that EPA will be the lead regulatory agency over the buffer zone, and CDPHE will be the lead regulatory agency over the industrial area. Additional clarification of the CDPHE and EPA roles will be defined in an EPA/CDPHE Memorandum of Agreement, expected to be finalized in January, 1996.

As a result of the Workout Session, a working group was formed to develop a consensus position on the appropriate cleanup standards that should apply to RFETS. This Action Level Framework presents the final product of the working group. It has been developed in a manner generally consistent with the conceptual vision and carve-out. In some cases, the working group found it necessary to more precisely define aspects of the conceptual vision so that applicability of action levels and required mitigating actions could be completely defined. The goal of the Action Level Framework is to

- a provide a basis for future decision-making,
- b define the common expectations of all parties, and
- c incorporate land- and water-use controls into site cleanup

The working group consisted of DOE, EPA, CDPHE, and Kaiser-Hill staff. This document represents a consensus of these parties.

### **1.2 Programmatic Assumptions**

The working group developed this framework using the following inter-related programmatic or site-wide assumptions:

- 1 The framework must be consistent with the Conceptual Vision
- 2 Implementation of the framework must protect human health and the environment
- 3 Implementation of the framework must protect surface water uses and quality

### **1.3 Outside Factors**

The working group recognizes that there are several factors outside of our control. Foremost among these factors is the Water Quality Control Commission (WQCC). The WQCC determines

water quality standards throughout Colorado. The consensus position presented herein delineates several changes to existing use designations and standards for water at RFETS. There is no guarantee that the WQCC will make the changes this document recommends.

Another factor that could affect the positions presented in this document is public response to the conceptual vision, other Workout Session issue resolutions, and these action levels. Specifically, the response of the down-stream municipalities, including Westminster, Broomfield, Thornton, and Northglenn, will be extremely important in finalizing these standards and action levels.

## 2 0 SURFACE WATER

(12/5/95)

- 2 1 Some of the surface water quality standards proposed herein differ from the existing water quality standards. These will necessitate a review and change by the Water Quality Control Commission (WQCC). CDPHE agrees to jointly approach the WQCC with DOE and Kaiser-Hill to accomplish these changes. Modification requests for the surface water quality standards must provide sufficient rationale and justification to document that all existing and potential uses will be protected.

Once the changes to the standards have been made, the new standards promulgated by the Water Quality Control Commission (WQCC) will be applied to the surface water at RFETS. In addition, points of compliance have been determined to measure water quality and compliance ramifications are delineated. This is consistent with the Conceptual Vision.

In specific areas where practical remedial efforts fail to lower contaminant concentrations below the standards, the implementing agencies (EPA and CDPHE-HMWMD) will authorize alternate concentration limits, if sufficient rationale and justification are provided. Temporary and area-specific alternate concentration limits may also be proposed during approved remedial activities which are expected to impact surface water. Setting alternate concentration limits will not affect required compliance at the outfall of the terminal ponds and may require future re-assessment of impacts to other affected media.

Surface water exists in Areas 2, 3 and 4 of the Vision, as well as immediately off-site. The standards and points of compliance presented below are based on the following "fine-tuning" of the Vision-delineated areas (**this assumes no changes to current configurations**):

- A Area 2 will include all surface water down to, and including, the terminal ponds (Ponds A-4 and B-5) in Walnut Creek. For Woman Creek, only Pond C-2 is in Area 2.
- B Areas 3 and 4 will include the streams from the terminal ponds to the plant boundary in Walnut Creek and all of Woman Creek except Pond C-2.

## 2 2 Standards

- A Areas 3 and 4 - Big Dry Creek Segment 4

### 1 Non-radionuclides

a) No change to the current surface water standards is proposed. The standards that apply throughout this stream segment are based on current and **potential** surface water uses consistent with the Vision's **goal of protecting all uses**.

- Aquatic Life - Warm 2
- Recreation 2
- Agricultural
- Domestic Use

b) The numerical standards associated with each of these use classifications are included in Table 2-1.

### 2 Radionuclides

a) The standards that apply throughout the designated stream segment are based on  $10^{-6}$  increased carcinogenic risks to human health from direct exposure which includes consumption.

- b) The numerical values are  
0.15 pCi/l for plutonium  
0.15 pCi/l for americium

3 Points of Compliance

- a) In order to protect any use in this segment, as required by the Vision, and to protect surface water that is beyond DOE's control, the points of compliance will be placed at the **existing** sample locations at the outfalls of the terminal ponds (Ponds A-4, B-5, and C-2) in both Walnut and Woman Creeks
- b) Compliance will be measured using a 30-day moving average for those contaminants for which this is appropriate. When necessary to protect a particular use, acute and chronic levels will be measured differently as described in current sampling and analysis plans

B Area 2 - Big Dry Creek Segment 5

1 Non-radionuclides

- a) The water use classifications that will apply throughout this stream segment are based on current and potential surface water uses consistent with the Vision

- Aquatic Life - Warm 2
- Recreation 2
- Agricultural

Currently, a domestic use classification also applies to this segment. Removing this classification would be consistent with the Vision.

- b) The numerical standards for nonradionuclides in Segment 5 are listed in Table 2-2. Table 2-2 has been prepared from the following:

1) Metals and Inorganics.

- all temporary modifications currently in effect will be extended and will continue to apply
- for all other metals, the lower of either the Aquatic Life values listed in Table III of the Basic Standards and Methodologies for Surface Water (5 CCR 1002-8, §3.1.0) or the Segment Specific Water Quality standards apply.
- for all other inorganics, Segment Specific Water Quality standards apply

2) Organic Chemicals:

- all temporary modifications currently in effect will be extended and will continue to apply.
- for all other organic chemicals, the maximum allowable concentration (MACs) for Segment 5 will be calculated by applying a mass-balance equation using the lowest value for each constituent within the standards associated with the four use classifications for Segment 4 of Big Dry Creek so as to be protective of Segment 4 waters. This equation will be used to back-calculate maximum upstream concentrations that will maintain water quality at the points of compliance without allowing treatment within waters of the State. The Working Group has not developed the MACs yet, but recommends that they be developed jointly by all parties, including other

stakeholders (i.e., the downstream cities at a minimum), prior to January 15, 1996. *[Example will be provided on 12/6/95]*

- 2 Radionuclides
  - a) The standards that apply throughout Segment 5 are based on  $10^{-6}$  risks to human health
  - b) The numerical values are:
    - 0.15 pCi/l for plutonium
    - 0.15 pCi/l for americium
- 3 Points of compliance
  - a) Points of compliance will be established at the outfalls of the terminal ponds.
  - b) For existing contaminant sources and influent streams, compliance will not be measured or enforced upstream of these points for some period yet to be determined but linked to completion of ASAP and fulfillment of the Vision.
  - c) However, new-source performance criteria will be applied to all new influent streams after January 1, 1996

## 2.3 Non-compliance Action Determinations

- A When contaminant concentrations exceed the standards listed in Table 2-1 or the radionuclide standards at a point of compliance, remedial action will be required. The specific action will be determined on a case-by-case basis, but will be designed such that surface water will meet the Segment 4 standards at the points of compliance.
- B When contaminant concentrations exceed the Segment 5 surface water standards or MACs (Table 2-2) at a monitoring station in Segment 5, a determination of the contaminant source (including simulation of effect) must be performed. If the source can be identified, it must be mitigated. If the source can not be delineated, surface water use protection must be evaluated. The design goal for actions to remediate exceedances of the radionuclide standard is 0.15 pCi/L.
- C If a higher standard or MAC is needed based upon infeasibility, any newly proposed standards or MAC should be based on stream loadings and fate and transport considerations. Changes in standards or MACs will only be appropriate if compliance with surface water standards is maintained at points of compliance. Monitoring points will be established by consensus of all parties at new or existing monitoring sites at appropriate locations in various stream segments.
- D Only when DOE and/or Kaiser-Hill (or appropriate sub-contractors) fail to report exceedance of the standards for a period longer than that allowed by the regulations, or when DOE and/or Kaiser-Hill (or appropriate sub-contractors) fail to initiate the actions delineated above within 30 days of the known exceedance, will DOE and/or Kaiser-Hill be subject to regulatorily defined fines and penalties.



## **2.4 Surface Water Monitoring Network**

- A The surface water monitoring network will continue to operate as currently established unless subsequent changes are agreed to by all parties**
- B All parties will receive periodic surface water monitoring reports which will highlight any exceedances of surface water standards or MACs and any significant changes to surface water flow conditions**

### 3.0 GROUND WATER

(12/5/95)

3 1 Action levels for ground water must be protective of surface water standards and quality as well as the ecologic resources. As stated in the Conceptual Vision, domestic use of ground water at RFETS will be prevented through institutional controls. Since no other human exposure to ground water is foreseen, ground water action levels are not based upon human health protection. This framework for ground water action levels assumes that all contaminated ground water emerges to surface water before leaving the site.

3 2 Action Levels The strategy for ground water is intended to prevent contamination of surface water. Ground water standards will, therefore, be the same as the Segment 5 surface water standards or MACs (see Section 2.2.B.1.b.2 and Table 2-2). If any organic constituents are missing from this table, the basic state-wide standards for organics (5 CCR 1002-8, §3.11.0) will apply. Action levels are based on the standards and MACs, and will trigger and guide ground water management actions. MACs are calculated for each major drainage area - North Walnut Creek, South Walnut Creek, and Woman Creek. A three-tiered action level approach is presented below and is dependent on contaminant concentrations and location within a plume.

A Tier I - Near-Source Action Levels for Accelerated Actions

- 1 Action levels =  $100 \times [MCLs]$  (see Table 3-1)
- 2 Applies in areas of high ground water contaminant concentrations
- 3 Designed to identify high concentration ground water "sources" that present a near-term risk to surface water and should be addressed through an accelerated action

B Tier II - Distal Action Levels

- 1 Action levels = Ground water standards
- 2 Designed to prevent ground water contaminated above ground water standards from reaching surface water by triggering ground water management actions when necessary

C Tier III - Surface Water Protection Action Levels

- 1 Action levels = Ground water standards
- 2 Tier III wells have been selected by mutual agreement of all parties from the monitoring well network. See Section 3.4.C

### 3 3 Action Determinations

A Tier I

- 1 If Tier 1 action levels are exceeded, a pathway evaluation will be performed. An evaluation is required to determine if remedial or management action is necessary to prevent ground water contaminated above ground water standards

from reaching surface water. If this evaluation determines that action is necessary, the type and location of the action will be delineated and implemented as an accelerated action. Such a pathway This evaluation may include a trend analysis based on existing data showing that there is A accelerated action priority will be given to plumes showing no significant decreasing trend in ground water contaminant concentrations over 2 years ~~[However, if a subsurface soil removal has been performed within the plume area, trend analysis can be performed with subsequent data]~~ If the pathway evaluation indicates that ground water exceeding ground water standards will emerge into surface water, then a process to identify, evaluate, and implement efficient, cost effective, and feasible ground water management action is triggered.

- 2 Additional ground water that does not exceed the Tier I action levels may still need to be remediated or managed through accelerated actions or RODs to protect surface water quality or ecological resources and/or prevent action level exceedances at Tier II and Tier III uncontaminated wells (e.g., lower-level, but fast-moving contamination). The plume areas to be remediated and the cleanup levels or management techniques utilized will be determined on a case-by-case basis.
- 3 Any accelerated actions will be taken in accordance with the Conceptual Vision document and incorporated into the Environmental Priority List.

B Tier II

- 1 If contaminant concentrations in a previously uncontaminated well exceed the ground water standards during a regular sampling event, monthly sampling in that well will be required. Three consecutive monthly samples showing contaminant concentrations greater than ground water standards will trigger action. Required actions will initially consist of additional an evaluation to determine if remedial or management action is necessary to prevent ground water contaminated above ground water standards from reaching surface water action level exceedances at Tier III wells. If action is necessary, the type and location scope of the action will be delineated and implemented.
- 2 If the ground water monitoring network identifies significant changes to hydrologic conditions (i.e., changes in gradient, water levels and/or contaminant concentrations), an evaluation of the potential impacts to surface water will be required if determined to be necessary by the parties.

C Tier III

- 1 If concentrations in a Tier III well exceed the ground water standards during a regular sampling event, monthly sampling in that well will be required. Three consecutive monthly samples showing contaminant concentrations greater than ground water standards will require a ground water remedial action. The ground water action will be determined on a case-by-case basis, but will be designed to treat, contain, manage, or mitigate the contaminant plume.
- 2 Situations where ground water contaminated at levels above the ground water standards is currently or likely emergent into the surface water will trigger a Tier III action. These situations currently exist at:

- a. the OU 2 plume north of the Mound emergent into ponds B-1 and B-2,
- b. the OU 2 plume south of the 903 pad and Ryan's Trench likely emergent into Woman Creek,
- c. the Solar Ponds plume emanating north and likely emergent into Walnut Creek, and
- d. the leachate emanating from the OU 7 Landfill and emergent into the unnamed northern tributary of Walnut Creek.
- e. *[CCl4 plume in 118.1?????]*

- D 1 Efficient, cost-effective, and feasible actions that are taken to remediate or manage contaminated ground water may not necessarily be taken at the leading edge of plumes, but rather at a location within the plume. Factors contributing to this situation could include technical impracticability at the plume edge, topographic or ecologic problems at the plume edge, etc. The parties recognize that this situation may result in a portion of a plume that will not be remediated or managed. This plume portion may cause exceedance of ground water standards at Tier III wells or exceedance of surface water standards. When an up-gradient ground water action is taken that results in this situation, DOE and Kaiser-Hill may request relief from the ground water and/or surface water standards. CDPHE and EPA will evaluate the request and may grant temporary relief or alternate concentration limits for a specific area. Soil or subsurface soil source removals will not be considered as the sole justification for alternate concentration limits. In addition, alternate concentration limits will be determined such that surface water use classifications are not jeopardized and surface water quality does not exceed standards at points of compliance.
- 2 Ground water plumes that can be shown to be stationary and do not therefore present a risk to surface water, regardless of their contaminant levels, will not require remediation or management. They will require continued monitoring to demonstrate that they remain stationary.

### 3.4 Ground Water Monitoring Network

- A. The ground water monitoring network will continue to operate as recently modified unless subsequent changes are agreed to by all parties.
- B. All parties will receive periodic ground water monitoring reports, which will include all data produced during the period and highlight any exceedances of the ground water standards plus any significant changes in hydrologic conditions.
- C. Tier III wells
  - 1. Tier III wells have been selected from the current monitoring network where practical and new wells have been proposed where apparent gaps exist.

- 2 Tier III wells are currently uncontaminated. In general, Tier III wells are located between the downgradient edge of each plume and the surface water towards which the plume is most directly migrating.
  - 3 Tier III wells were not chosen with regard to the location of surface water points of compliance.
  - 4 If additional plume information dictates, new or alternate wells may need to be chosen.
  - 5 The designated wells can be found in Table 3-2.
- D. All ground water plumes that exceed the ground water standards must continue to be monitored.
- E. All ground water remedies, and some soil remedies, will require ground water performance monitoring. The amount, frequency, and location of any performance monitoring will be based on the type of remedy implemented and will be determined on a case-by-case basis within decision documents.

### 3.5 Ground Water Classifications

- A. Three classifications currently apply to ground water at RFETS:
1. Domestic Use Quality
  2. Agricultural Use Quality
  3. Surface Water Protection
- B. Because the Conceptual Vision restricts ground water use in all areas, CDPHE would support DOE and Kaiser-Hill in requesting that the domestic use and agricultural use classifications be removed by petitioning the WQCC.

## 4 0 SUBSURFACE SOIL

(12/5/95)

### 4 1 Action levels for subsurface soil are protective of

- A human exposure appropriate for uses described in the Conceptual Vision document,
- B surface water standards via ground water transport, and
- C ecological exposure appropriate for uses described in the Conceptual Vision document

### 4 2 Action Levels      The subsurface soil action levels have been calculated using a two-tier approach. ~~Tier I, the upper tier, has been developed to identify source areas that will be addressed through an accelerated action. Tier II, the lower level, has been developed to be protective of human and ecological exposure, as well as protective of surface water quality.~~

#### A Tier I

- 1 All subsurface soils capable of leaching volatile organic compounds to groundwater at concentrations greater than or equal to  $100 \times [MCL]$  will trigger subsurface soil source removals. ~~These are to be accomplished through accelerated actions.~~
- 2 Contaminant-specific Tier I action levels have been determined using a soil/water partitioning equation and a dilution factor from EPA's Draft Soil Screening Guidance, (1994). These derived values and the parameters used to derive them are listed in Table \_\_\_\_\_. The subsurface media characteristics for these calculations are based on site-specific data or conservative values where representative site values cannot be determined. Where subsurface characteristics in a particular area within RFETS differs significantly from those chosen as representative of the entire site, those alternate values should be used.
- 3 No Tier I action levels have been determined for non-volatile contaminants due to their generally limited mobility in soil.

#### B Tier II

- 1 Human exposure to subsurface soil is envisioned only in the Industrial Area (Area 1 of Conceptual Vision). Therefore, Tier II action levels protective of human exposure are calculated on the basis of Construction Worker exposure. This includes dermal contact with and direct ingestion of subsurface soils, inhalation of particulates and VOCs, and external irradiation. The attached Tables 5-1 through 5-5 provide the equations and parameters used to calculate the subsurface soil action levels. ~~The parameter values in these tables will be consistent with the previously agreed-upon values in the 6/15/95 version of the risk assessment template. Discussions on a few of these parameters are still ongoing between the risk assessors of all parties.~~ Table \_\_\_\_\_ through \_\_\_\_\_ present the calculated action levels and the values derived for this exposure scenario. *[The Construction Worker action levels must include quantitative inclusion of*

*dermal exposure ]*

- 2 Additional subsurface soil may need to be remediated or managed to protect surface water quality via ground water transport or ecological resources. The amount of soil and the protective remediation levels or management techniques will be determined on a case-by-case basis *[Subsurface soil presenting unacceptable ecological risks ( $HI \geq 1$ ) identified using the previously approved ecological risk assessment methodology will be evaluated for remediation or management. Where remedial actions to protect ecologic resources can be implemented without damaging other ecologic resources, remediation and/or management actions will be implemented.]*

#### 4.3 Action Determinations

- A When contaminant levels in subsurface soil exceed ~~either Tier I or Tier II~~ action levels, or when an action is necessary to protect surface water or ecological resources, a process to identify, evaluate, and implement efficient, cost-effective, and feasible remediation or management actions will be triggered.
- B Appropriate ~~remedial or~~ management actions will be determined through this process on a case-by-case basis, and may include the removal, treatment, disposal, or in-place stabilization of contaminated subsurface soils.
- C These actions may be implemented by means of an accelerated action or addressed as necessary in the ROD for the affected area.
- D Single geographically isolated data points of subsurface soil contamination above the ~~Tier I or Tier II~~ action levels in ~~Table \_\_\_\_\_~~ will be evaluated for potential source magnitude. These single points will not necessarily trigger a source removal, ~~remedial, or management action~~, depending on the source evaluation.
- E The need to excavate below the water table for source removal actions will be determined on a case-by-case basis.
- F Any accelerated actions will be taken in accordance with the Conceptual Vision document and incorporated into the Environmental Priority List.

## 5.0 SURFACE SOIL

(12/5/95)

- 5 1 Surface soil will be defined to be the upper six inches of soil. Action levels for surface soil are protective of
- A human exposure appropriate for uses specified in the Conceptual Vision document,
  - B surface water quality via runoff, and
  - C ecological exposure appropriate for uses specified in the Conceptual Vision document

- 5 2 Action Levels The surface soil action levels are calculated on the basis of protection of appropriate human exposure. All surface soil contaminated at levels above the action levels will be remediated or managed in such a way as to mitigate the unacceptable human exposure.

- A Human Exposure - The attached Tables S-1 through S-2 provide the equations and parameters used to calculate the soil action levels. *[The parameter values in these tables will be consistent with the previously agreed-upon values in the 6/15/95 version of the risk assessment template. Discussions on a few of these parameters are still ongoing between the risk assessors of all parties.]* Table S-1 through S-2 present the calculated action levels and the values derived for these exposure scenarios.

- 1 Industrial Area (Area 1 of Conceptual Vision) Action levels will be based on Office Worker exposure. This includes dermal contact with and direct ingestion of surface soil, inhalation of particulates and VOCs, and external irradiation. *[The Office Worker action levels must include quantitative inclusion of dermal exposure and indoor inhalation of VOCs.]*
- 2 Inner Buffer Zone (Area 2 of Conceptual Vision) Action levels will be based on Open Space Recreational User exposure. This includes dermal contact with, incidental ingestion of, and particulate inhalation of dust, surface soil or dry sediment, and external irradiation. *[The Recreational User action levels must include quantitative inclusion of dermal exposure.]*

- B Additional soil may need to be remediated or managed to protect surface water quality via runoff or ecological resources. The amount of soil and the protective remediation levels and/or management technique will be determined on a case-by-case basis.

### 5 3 Action Determinations

- A When contaminant levels in surface soil exceed action levels, or when an action is necessary to protect surface water or ecological resources, a process to identify and evaluate and implement efficient, cost-effective, and feasible remediation or management actions will be triggered.



- B Appropriate ~~remedial~~ or management actions will be determined through this process on a case-by-case basis, and may include the removal, treatment, disposal, or in-place stabilization of contaminated surface soils
- C These actions may be implemented by means of an accelerated action or addressed as necessary in the ROD for the affected area
- D Any accelerated actions will be taken in accordance with the Conceptual Vision document and incorporated into the Environmental Priority List

## 5.1

Table 4 Rocky Flats Site-Specific Exposure Factors for Setting Surface Soil Standards

Complete Exposure Routes	Future On-Site Office Worker	Future On-Site Construction Worker	Future Open Space Recreational Receptor
<b>Soil/Sediment /Dust Ingestion</b>	RME Values Always Used to Calculate PRGs		
Ingestion Rate Child (mg/day)	NA	NA	100
Ingestion Rate Adult (mg/day)	50	480	50
Exposure Frequency (days/year)	250	30	25
Exposure Duration child/adult (years)	25	1	6/24
Body Weight Child/Adult (years)	70	70	15/70
Averaging Time Child/Adult (days)	9125 noncarcinogens 25550 carcinogens	365 noncarcinogens 25550 carcinogens	2190/8760 noncarcinogens 25550 carcinogens

Table 4 Rocky Flats Site-Specific Exposure Factors for Setting Surface Soil Standards

Complete Exposure Routes	Future On-Site Office Worker	Future On-Site Construction Worker	Future Open Space Recreational Receptor
Soil/Sediment/Dust Inhalation	RME Values Always Used to Calculate PRGs		
Inhalation Rate (m <sup>3</sup> /day)	0.83	1.4	1.4
Respirable Fraction (PM <sub>10</sub> )	0.46	0.46	0.46
Exposure Time (hr/day)	8.0	8.0	5.0
Exposure Frequency (days/year)	250	30	25
Exposure Duration (years)	25	1	30
Body Weight (kg)	70	70	70
Averaging Time (days)	9125 noncarcinogens 25550 carcinogens	365 noncarcinogens 25550 carcinogens	10950 noncarcinogens 25550 carcinogens

## 5.3

Table 4 Rocky Flats Site-Specific Exposure Factors for Setting Surface Soil Standards

Complete Exposure Routes	Future On-Site Office Worker	Future On-Site Construction Worker	Future Open Space Recreational Receptor
Soil/Sediment/Dust Dermal Contact	RME Values Always Used to Calculate PRGs		
Exposed Skin Surface (cm <sup>2</sup> )	2100	4700	5300
Soil Adherence (mg/cm <sup>2</sup> )	1 0	1 0	1 0
Skin Absorption Factor	CS	CS	CS
Exposure Frequency (days/year)	250	30	25
Exposure Duration (years)	25	1	30
Body Weight (kg)	70	70	70
Averaging Time (days)	9125 noncarcinogens 25550 carcinogens	365 noncarcinogens 25550 carcinogens	10950 noncarcinogens 25550 carcinogens

Table 4 Rocky Flats Site-Specific Exposure Factors for Setting Surface Soil Standards

Complete Exposure Routes	Future On-Site Office Worker	Future On-Site Construction Worker	Future Open Space Recreational Receptor
Soil/Sediment /Subsoil External Irradiation	RME Values Always Used to Calculate PRGs		
Gamma Exposure Time Factor ( $T_e$ )	0.3	0.3	0.2
Gamma Shielding Factor ( $1-S_e$ )	0.8	1.0	1.0
Exposure Frequency Ratio (unitless)	0.7	0.1	0.07
Exposure Duration (years)	25	1	30

Table 4 Rocky Flats Site-Specific Exposure Factors for Setting Surface Soil Standards

Complete Exposure Routes	Future On-Site Office Worker	Future On-Site Construction Worker	Future Open Space Recreational Receptor
Groundwater /Subsoil VOC inhalation	RME Values Always Used to Calculate PRGs		
Inhalation Rate (m <sup>3</sup> /day)	0.83	NA	NA
Exposure Time (hr/day)	8.0	NA	NA
Exposure Frequency (days/yr)	250	NA	NA
Exposure Duration (years)	25	NA	NA
Body Weight (kg)	70	NA	NA
Averaging Time	9125 noncarcinogens 25550 carcinogens	NA	NA

## **BASIS FOR RADIATION DOSE BASED REMEDIATION**

Remediation of radioactive materials in environmental media should be based on a radiation dose standard, and not a risk based standard. This is based on an analysis of the following standards. Also, these standards support the use of a 15 millirem/year annual radiation dose limit for remediation activities.

### **DOE Order 5400.5**

DOE Order 5400.5, "Radiation Protection of the Public and the Environment," states in Section IV 4 a that guidelines for residual concentrations of radionuclides shall be derived from the basic dose limit of 100 millirem/year by means of an environmental pathway analysis. This 100 millirem limit applies to all pathways of exposure, and the ALARA philosophy must be applied to this radiation dose limit.

### **Proposed 10CFR834**

Proposed 10CFR834, "Radiation Protection of the Public and the Environment," will replace DOE Order 5400.5. Proposed 10CFR834 states in paragraph 834.302 that the authorized limit of 100 millirem will be used to derive concentrations of radioactive materials in soil using approved models. This 100 millirem limit applies to all pathways of exposure, and the ALARA philosophy must be applied to this radiation dose limit as well.

### **Proposed 40CFR196**

On 10/21/93, the EPA proposed 40CFR196, "EPA Radiation Site Cleanup Regulation," in 58FR54474. The EPA proposed an annual radiation dose limit of 15 millirem. This regulation also states that the ALARA philosophy needs to be applied. The summary section states "Although the radiation cleanup standards proposed in today's rule apply specifically to federal facilities, they may also apply to other CERCLA cleanup activities as 'Applicable or Relevant and Appropriate Requirements' (ARARs)." It is also stated that this proposed standard was the result of a coordinated effort between the EPA, the NRC, the DOE and the DOD. The attached EPA presentation further emphasizes the use of the 15 millirem/year limit.

### **Proposed NRC "Radiological Criteria for Decommissioning"**

On 8/22/94, the Nuclear Regulatory Commission proposed radiological criteria for decommissioning in 59FR43200. The NRC proposed an annual radiation dose limit of 15 millirem. A safety margin is applied to the 100 millirem/year annual dose to arrive at the 15 millirem/year limit. This criteria document also states that ALARA philosophy needs to be applied.

December 6, 1995

# RADIATION DOSE BASED SOIL ACTION LEVELS

## SURFICIAL SOIL ACTION LEVELS

Radionuclide	15 Millirem (pCi/gram)	100 Millirem (pCi/gram)
<b><u>OFFICE WORKER EXPOSURE SCENARIO</u></b>		
Americium-241	1 42E+02	9 47E+02
Plutonium-239	1 64E+03	1 09E+04
<b><u>OPEN SPACE EXPOSURE SCENARIO</u></b>		
Americium-241	1 43E+03	9 53E+03
Plutonium-239	1 61E+04	1 07E+05



# Development of the EPA Radiation Site Cleanup Regulation

John!  
F.V.I.  
May be  
helpful in selling "  
your more reasonable  
side approach."

Dave M. King



# ***Introduction***

- EPA is developing radiation site cleanup standards for:
  - Soil
  - Groundwater
  - Surface Water
  - Structures
- Sites to be released for beneficial public use.
- Rule does not mandate the cleanup of sites.

# *The Problem*

- Thousands of sites
- All types of radioactive material
- All environmental media
- Cleanups progressing slowly due to:
  - Lack of regulations
  - Technical complexity
  - Public relations

# ***Coordination***

- State and Local Governments
- Native American Tribes
- Environmental and Public Interest Groups
- Trade and Professional Associations
- Other Federal Agencies

# ***Federal and State Coordination***

- NACEPT Subcommittee On The Radiation Site Cleanup Rule
- Conference of Radiation Control Program Directors (CRCPD)
- Association of State and Territorial Solid Waste Management Officials (ASTSWMO)
- Interagency Steering Committee and Work Groups

# ***Goals of The Rulemaking***

- Clear, consistent, and protective health-based cleanup standards
- Promote beneficial land uses
- Facilitate radiation site cleanups
- Implementable and promotes innovative technology

# ***Atomic Energy Act Provides Statutory Authority For The Rule***

- Authorizes EPA to issue regulations
- Authorizes EPA to issue guidance
- Other Federal agencies must implement EPA generally applicable radiation standards

# ***Draft Rule Covers Federal Facilities With Radioactive Contamination***

- Department of Energy sites
- Department of Defense sites
- NRC and Agreement State licensees
- Potential ARAR at Superfund sites



# ***Exemptions***

- Uranium mill tailings
- Superfund sites with remedy selected

# ***A Health-Based Exposure Limit***

- 15 mrem/yr above background
- Corresponds approximately to  $3 \times 10^{-4}$  incremental cancer incidence risk
- MCLs for ground water
- Structures should follow EPA Radon Program guidelines

# ***Rationale for $10^{-4}$ Risk Level***

- Allows for the recognition of background radiation
- Technological feasibility
- Consistent with other EPA radiation protection programs

# ***Rationale for $10^{-4}$ Risk Level***

## ***(cont'd)***

- CERCLA risk range is  $10^{-4}$  to  $10^{-6}$
- Cleanups of radioactively contaminated Superfund sites have met  $10^{-3}$  to  $10^{-4}$  risk levels
- Preliminary analyses indicate that risks to the public averted due to remedial activity and the risks to the public and workers caused by the remedial activity is balanced at approximately  $10^{-4}$

### ***3 Types of Land Use Addressed***

1. Released without active control measures
2. Released with active control measures
3. On-site Storage/Disposal

# ***Sites Released Without Active***

## ***Control Measures***

- As a first priority, sites should be cleaned up for use without active control measures to ensure that individuals are not exposed to radioactive materials at levels in excess of 15 mrem/yr

# **Sites Released With Active Control Measures**

- Use of active control measures (e.g., institutional controls, engineered barriers) must ensure that members of the public do not receive doses over 15 mrem/yr
- Public notice and comment process required
- 75 mrem/yr cap

# ***Assurance Requirements***

- For Sites Released With Active Control Measures
- Revisit Sites To Ensure Adequate Protection



# ***On-site Storage/Disposal***

- Requirements of Low Level Waste Rule must be met

# ***Implementation Guidance***

- Flexibility for implementing agencies
- Preamble references existing and future guidance documents
- Future guidance to indicate "work practices" that will facilitate cleanups on a consistent basis which are lower than 15 mrem/yr

# Public Notice and Comment Requirements

- Notify EPA Administrator
- Notify State, local, or Tribal governments, and any communities that could be affected by site cleanup activities
- Publish cleanup notification
- Establish public information repository
- Consider comments from public

# ***Public Notice and Comment Requirements (cont'd)***

- Six instances when required:
  - Initial intention to evaluate site for clean up
  - Determination of preferred future land use
  - Revision to preferred land use
  - Intention to release
  - Failure of active control measures
    - For land released with active controls only
  - Results of 5-year review
    - For land released with active controls only

# ***Public Participation***

- Implementing agencies must follow all applicable public participation processes
- Public participation activities should complement not duplicate or supersede other activities

# *Community Groups*

- Use of community groups encouraged
- Establish when no other public participation process exists

# ***Schedule for Proposed Rule***

Proposed Rule to OMB      Winter 1995

Proposed Rule Published  
in Federal Register      Spring 1995

# EPA/NRC Rules Compared

<i>Category</i>	<i>Draft EPA Radiation Site Cleanup Regulation</i>	<i>Proposed NRC Rule on Decommissioning</i>
Cleanup Limit	15 mrem/yr Annual Committed Effective Dose, Ground Water Must Meet Radionuclide MCLs	15 mrem/yr Total Effective Dose Equivalent Plus ALARA
Applicability	Federal Facilities And NRC Licensees	Structures, Soils, Ground Water, and Other Media
Radon	Recommend following EPA Radon Program Guidelines	No Separate Standard
Time Frame	1,000 years	1,000 years



# EPA/NRC Rules Compared (cont'd)

Category	Draft EPA Radiation Site Cleanup Regulation	Proposed NRC Rule on Decommissioning
Land Use	<ol style="list-style-type: none"> <li>1 Release Without Active Control Measures</li> <li>2. Release With Active Control Measures</li> <li>3. On-Site Storage/Disposal</li> </ol>	Goal Is Cleanup To Unrestricted Use; Cleanup To Restricted Use Possible
Assurance Requirement	Verification of Post-Remedial Dose Every 5 Years For Sites Released With Active Control Measures	No Requirement
Public Participation	<ol style="list-style-type: none"> <li>1. Initial Intention To Evaluate Site for Cleanup</li> <li>2. Determination of Preferred Land Use</li> <li>3. Revision To Preferred Land Use</li> <li>4 Intention to Release</li> <li>5 Failure of Active Control Measures</li> <li>6 Results of 5-Year Review</li> </ol>	NRC To Notify State And Local Governments, Publish Notice, Solicit Comment, Licensee Must Consider SSAB Advice When Proposing Restricted Release
Waste Management	Low Level Waste Rule	Considered Only in Determining ALARA

## DOE/KAISER-HILL SURFACE WATER GOALS AND STANDARDS

### General Assumptions

- Change classification for all streams to Segment 1 work with local governments
- Actual uses will drive standards and goals
- Regulations are flexible enough to accommodate this approach
- Final vision is achieved when DOE activity at the site ceases

### Active Phase

This is the time period between now and achievement of the interim state (ASAP) when active remediation and risk reduction will be occurring

### Assumptions

- Groundwater cleanup actions will not be directly linked to surface water standards or goals We will use 100 x MCLs
- Fishing will not be permitted – administrative controls are, and will continue to be, in place during the interim phase which expressly excludes water supply plus fish standards classification
- Surface water will be managed under EPA jurisdiction
- Nitrates emanating from OU 4 are of lesser priority than VOC plumes impacting surface water

### Radionuclide Goals

- Point of Evaluation is at the outfall of the terminal ponds

- Pond Discharge goals

A-4 0.3 pCi/l

B-5 0.3 pCi/l

C-2 0.5 pCi/l

**Note** May consider seasonally standards higher in springtime/summer and lower in fall/winter

- Evaluation will be points located at existing gaging stations influent to the ponds  
Exceedence of a 0.15 pCi/l 30-day average will trigger source evaluation and potential mitigation actions

- The Temporary Treatment Facility (TTF) will treat relatively high concentrations of liquid wastes (50,000-20,000 pCi/l) to a discharge value into the Sewage Treatment Plant (STP) which may range from 150 pCi/l to 15 pCi/l. These wastes will be generated during risk reduction activities associated with liquid stabilization subsequent tank and line rinsing. Approximately 10 to 1 dilution is expected to occur in the STP resulting in discharge values ranging from 15 pCi/l to 1.5 pCi/l or less. The life-cycle cost of a TTF (capital and operations) which would achieve sewage treatment plant discharges of 15 pCi/l is approximately \$111M. Treating to achieve STP discharges below this value will result in a life-cycle cost of \$170M.
- The point of discharge for the STP/TTF may be in or immediately below the pond systems. Pond discharge goals may be modified to accommodate radionuclides in the STP and/or TTF.

#### Non-Radionuclide Standards

- Point of Compliance will be at the outfall of the terminal ponds
  - Generally, existing modifications stand and must be consistent with stream standards
  - Segment 1 stream standards apply
    - Agriculture
    - Aquatic Life Warm 2
    - Recreation 2
- Within the ponds and upstream in the main channel up to first influent gauging station temporary modifications remain in place as a trigger for source evaluation and mitigation, these may be expanded to address additional contaminants as appropriate
- At Indiana Street segment 1 standards will apply

#### Interim and Walkaway

Interim state is achievement of ASAP. Walkaway is shutdown of all DOE active management of the site. At this point in time the vision has been achieved.

Groundwater remediation will not impact surface water at the point of discharge, although groundwater remediation operations will still be occurring.

#### Radionuclide Goals

- Point of Evaluation will be established at the outfall <sup>of</sup> to the terminal ponds with a 0.15 pCi/l goal
- Evaluation points located at existing gauging stations influent to the ponds. Exceedence of a 0.15 pCi/l 30-day average will trigger source evaluation and

potential mitigation actions

- A 0 15 pCi/l evaluation point will be established at Indiana Street

Non-Radionuclides Standards

- The following classifications would apply
  - Agriculture
  - Recreational 2
  - Water Supply
  - Aquatic Life Warm 2
- Given limited water resources at the site at interim/walkaway state a water + fish use for onsite waters is not anticipated

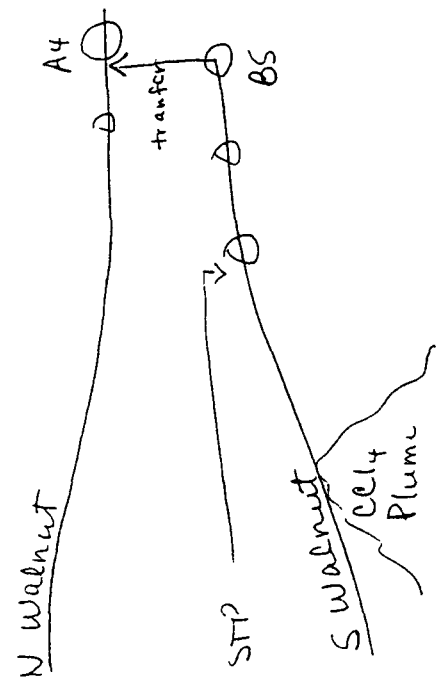
12/6  
Judy Bruch

Example of mass balance for determining Segment 5 organic concentration  
[Maximum allowable concentration]

- Given      Base flow in N Walnut Ck = 11.8 MGY  
            Base flow in S Walnut Ck = 5.9 MGY  
            STP discharge = 54.7 MGY into B3
- Assume    -a groundwater plume containing carbon tetrachloride is exiting into S Walnut Ck  
            -no allowance for treatment in the stream (eg volatilization)  
            -current batch mode of operation of the ponds  
            -no carbon tet in STP or N Walnut Ck

The worst case scenario for this situation occurs when the entire baseflow in S Walnut Creek is comprised entirely of carbon tet from the plume

Question    What is the maximum allowable concentration of carbon tetrachloride in S Walnut Ck which would be protective of the 0.025 ug/l standard set at the outfall from pond A4?



$$N_{Walnut} + S_{Walnut} + STP = Final$$

$$Q_1 C_1 + Q_2 C_2 + Q_3 C_3 = Q_{Final} C_{Final}$$

$$11.8(\phi) + 5.9(x) + 54.7(\phi) = 72.4(0.25 \mu g/l)$$

$$x = 31 \mu g/l \text{ CCl}_4$$

$MAC = 31 \mu g/l$

**Table 2-1: Non-rad Standards for Segment 4 (Areas 3 & 4)**

<i>Parameter</i>	<i>Standard</i>	<i>Units</i>	<i>Rationale</i>
<b>INORGANICS</b>			
Ammonia, unionized (Walnut Ck)	none		Standard for ammonia begins at Indiana Ave
Ammonia, unionized (Woman Ck)	0.1	mg/l	Segment 4a specific
Boron	0.75	mg/l	Segment 4 specific
Chloride	250	mg/l	Segment 4 specific
Chlorine	0.011	mg/l	Segment 4 specific
Cyanide	0.005	mg/l	Segment 4 specific
Nitrite	0.5	mg/l	Segment 4 specific
Nitrate	10	mg/l	Segment 4 specific
Sulfate	250	mg/l	Segment 4 specific
Sulfide	0.002	mg/l	Segment 4 specific
<b>METALS*</b>			
Arsenic, total recoverable	50	ug/l	Segment 4 specific
Beryllium, dissolved	4	ug/l	Segment 4 specific
Cadmium, dissolved	14.4 acute, 1.5 chronic	ug/l	Segment 4 specific - TVS
Chrome III, total recoverable	50	ug/l	Segment 4 specific
Chrome VI, dissolved	16 acute, 11 chronic	ug/l	Segment 4 specific - TVS
Copper, dissolved	24.1 acute, 15.8 chronic	ug/l	Segment 4 specific - TVS
Iron, total recoverable	1000	ug/l	Segment 4 specific
Iron, dissolved	300	ug/l	Segment 4 specific
Lead, dissolved	165 acute, 6.3 chronic	ug/l	Segment 4 specific - TVS
Manganese, total recoverable	1000	ug/l	Segment 4 specific
Manganese, dissolved	50	ug/l	Segment 4 specific
Mercury, total	0.01	ug/l	Segment 4 specific
Nickel, dissolved	1191 acute, 123 chronic	ug/l	Segment 4 specific - TVS
Selenium, total recoverable	10	ug/l	Segment 4 specific
Silver, dissolved	3.6 acute, 0.57 chronic	ug/l	Segment 4 specific - TVS
Zinc, dissolved	156 acute, 141 chronic	ug/l	Segment 4 specific - TVS
<i>* for metals based on TVS (Table Value Standard), a hardness value of 140 mg/l was used</i>			

**Table 2-1 (cont'd): Non-rad Standards - Segment 4 (Areas 3 & 4)**

ORGANICS			
Acenaphthene	1700 acute, 520 chronic	ug/l	Basic Standards - Aquatic Life
Acenaphthylene (PAH)	0 0028	ug/l	Basic Standards - Water + Fish, SSS *
Acrolein	68 acute, 21 chronic	ug/l	Basic Standards - Aquatic Life
Acrylonitrile	0 058	ug/l	Basic Standards - Water + Fish
Aldicarb	10	ug/l	Basic Standards - Water Supply
Aldrin	0 00013	ug/l	Basic Standards - Water + Fish, SSS
Anthracene (PAH)	0 0028	ug/l	Basic Standards - Water + Fish, SSS
Benzene	1	ug/l	Basic Standards - Water + Fish
Benzidine	0 00012	ug/l	Basic Standards - Water + Fish, SSS
Benzo(a)anthracene (PAH)	0 0028	ug/l	Basic Standards - Water + Fish, SSS
Benzo(a)pyrene (PAH)	0 0028	ug/l	Basic Standards - Water + Fish, SSS
Benzo(b)fluoranthene (PAH)	0 0028	ug/l	Basic Standards - Water + Fish, SSS
Benzo(k)fluoranthene (PAH)	0 0028	ug/l	Basic Standards - Water + Fish, SSS
Benzo(g,h,i)perylene (PAH)	0 0028	ug/l	Basic Standards - Water + Fish, SSS
BHC Hexachlorocyclohexane	100 acute	ug/l	Basic Standards - Aquatic Life
Bromodichloromethane (HM)	0 3	ug/l	Basic Standards - Water + Fish, SSS
Bromoform (HM)	4	ug/l	Basic Standards - Water + Fish, SSS
Butyl benzyl phthalate	3000	ug/l	Basic Standards - Water + Fish
Carbofuran	36	ug/l	Basic Standards - Water Supply
Carbon tetrachloride	0 25	ug/l	Basic Standards - Water + Fish
Chlordane	0 00058	ug/l	Basic Standards - Water + Fish, SSS
Chlorethyl ether (BIS-2)	0 03	ug/l	Basic Standards - Water + Fish, SSS
Chloromethyl ether (BIS)	0 0000037	ug/l	Site Specific Standard
Chlorobenzene	100	ug/l	Basic Standards - Water + Fish
Chloroform (HM)	6	ug/l	Basic Standards - Water + Fish, SSS
Chloroisopropyl ether (BIS-2)	1400	ug/l	Basic Standards - Water + Fish
4-chloro-3-methyl phenol	30 acute	ug/l	Basic Standards - Aquatic Life
Chlorophenol 2	4380 acute, 2000 chronic	ug/l	Basic Standards - Aquatic Life, SSS
Chloropyrifos	0 083 acute 0 041 chronic	ug/l	Basic Standards - Aquatic Life
Chrysene (PAH)	0 0028	ug/l	Basic Standards - Water + Fish, SSS
DDD	0 00083	ug/l	Basic Standards - Water + Fish

\*SSS = Site Specific Standard

<i>Parameter</i>	<i>Standard</i>	<i>Units</i>	<i>Rationale</i>
DDE	0 00059	ug/l	Basic Standards - Water + Fish
DDT	0 00059	ug/l	Basic Standards - Water + Fish, SSS
Demeton	0 1 chronic	ug/l	Basic Standards - Aquatic Life, SSS
Dibenzo(a,h)anthracene (PAH)	0 0028	ug/l	Basic Standards - Water + Fish, SSS
Dibromochloromethane (HM)	6	ug/l	Basic Standards - Water + Fish,SSS
Dichlorobenzene 1,2	620	ug/l	Basic Standards - Water + Fish
Dichlorobenzene 1,3	400	ug/l	Basic Standards - Water + Fish
Dichlorobenzene 1,4	75	ug/l	Basic Standards - Water + Fish
Dichlorobenzidine	0 039	ug/l	Basic Standards - Water + Fish, SSS
Dichloroethane 1,2	0 4	ug/l	Basic Standards - Water + Fish
Dichloroethylene 1,1	0 057	ug/l	Basic Standards - Water + Fish
Dichloroethylene 1,2 cis	0 03	ug/l	Basic Standards - Water + Fish
Dichloroethylene 1,2 trans	100	ug/l	Basic Standards - Water Supply
Dichlorophenol 2,4	21	ug/l	Basic Standards - Water + Fish
Dichlorophenoxyacetic acid	70	ug/l	Basic Standards - Water Supply, SSS
Dichloropropane 1,2	0 56	ug/l	Basic Standards - Water + Fish
Dichloropropylene 1,3	10	ug/l	Basic Standards - Water + Fish
Dieldrin	0 00014	ug/l	Basic Standards - Water + Fish, SSS
Diethyl phthalate	23000	ug/l	Basic Standards - Water + Fish
Dimethylphenol 2,4	2120 acute	ug/l	Basic Standards - Aquatic Life
Dimethyl phthalate	313000	ug/l	Basic Standards - Water + Fish
Di-n-butyl phthalate	2700	ug/l	Basic Standards - Water + Fish
Dinitrophenol 2,4	14	ug/l	Basic Standards - Water + Fish
Dinitro-o-cresol 4,6	13	ug/l	Basic Standards - Water + Fish
Dinitrotoluene 2,4	0 11	ug/l	Basic Standards - Water + Fish
Dinitrotoluene 2,6	330 acute, 230 chronic	ug/l	Basic Standards - Aquatic Life
Dioxin	1 3x10 <sup>8</sup>	ug/l	Basic Standards - Water + Fish, SSS
Diphenylhydrazine 1,2	0 04	ug/l	Basic Standards - Water + Fish
Endosulfan	0 11 acute, 0 056 chronic	ug/l	Basic Standards - Aquatic Life, SSS
Endosulfan sulfate	0 93	ug/l	Basic Standards - Water + Fish
Endrin	0 09 acute, 0 0023 chronic	ug/l	Basic Standards - Aquatic Life, SSS
Endrin aldehyde	0 2	ug/l	Basic Standards - Water + Fish
<i>Parameter</i>	<i>Standard</i>	<i>Units</i>	<i>Rationale</i>



Ethylbenzene	3100	ug/l	Basic Standards - Water + Fish
Ethylhexyl phthalate (BIS2)	1 8	ug/l	Basic Standards - Water + Fish
Fluoranthene (PAH)	42	ug/l	Basic Standards - Water + Fish
Fluorene (PAH)	0 0028	ug/l	Basic Standards - Water + Fish, SSS
Guthion	0 01 chronic	ug/l	Basic Standards - Aquatic Life, SSS
Heptachlor	0 00021	ug/l	Basic Standards - Water + Fish, SSS
Heptachlor epoxide	0 0001	ug/l	Basic Standards - Water + Fish
Hexachlorobenzene	0 00072	ug/l	Basic Standards - Water + Fish, SSS
Hexachlorobutadiene	0 45	ug/l	Basic Standards - Water + Fish, SSS
Hexachlorocyclohexane, alpha	0 0039	ug/l	Basic Standards - Aquatic Life, SSS
Hexachlorocyclohexane, beta	0 014	ug/l	Basic Standards - Water + Fish, SSS
Hexachlorocyclohexane, gamma	0 019	ug/l	Basic Standards - Water + Fish, SSS
Hexachlorocyclohexane, Technical	0 012	ug/l	Basic Standards - Water + Fish, SSS
Hexachlorocyclopentadiene	7 acute, 5 chronic	ug/l	Basic Standards - Aquatic Life
Hexachloroethane	1 9	ug/l	Basic Standards - Water + Fish, SSS
Ideno(1,2,3-cd)pyrene (PAH)	0 0028	ug/l	Basic Standards - Water + Fish, SSS
Isophorone	8 4	ug/l	Basic Standards - Water + Fish
Malathion	0 1 chronic	ug/l	Basic Standards - Aquatic Life, SSS
Methoxychlor	0 03 chronic	ug/l	Basic Standards - Aquatic Life, SSS
Methyl bromide (HM)	48	ug/l	Basic Standards - Water + Fish, SSS
Methyl chloride (HM)	5 7	ug/l	Basic Standards - Water + Fish, SSS
Methylene chloride (HM)	4 7	ug/l	Basic Standards - Water + Fish, SSS
Mirex	0 001 chronic	ug/l	Basic Standards - Aquatic Life, SSS
Naphthalene (PAH)	0 0028	ug/l	Basic Standards - Water + Fish, SSS
Nitrobenzene	3 5	ug/l	Basic Standards - Water + Fish
Nitrosodibutylamine N	0 0064	ug/l	Basic Standards - Water + Fish, SSS
Nitrosodiethylamine N	0 0008	ug/l	Basic Standards - Water + Fish, SSS
Nitrosodimethylamine N	0 00069	ug/l	Basic Standards - Water + Fish, SSS
Nitrosodiphenylamine N	4	ug/l	Basic Standards - Water + Fish, SSS
Nitrosopyrrolidine N	0 016	ug/l	Basic Standards - Water + Fish, SSS
N-Nitrosodi-n-propylamine	0 005	ug/l	Basic Standards - Water + Fish
PCBs	0 000044	ug/l	Basic Standards - Water + Fish, SSS
<i>Parameter</i>	<i>Standard</i>	<i>Units</i>	<i>Rationale</i>

Pentachlorobenzene	6	ug/l	Basic Standards - Water Supply
Pentachlorophenol	9 acute, 5 7 chronic	ug/l	Basic Standards - Aquatic Life
Phenanthrene (PAH)	0 0028	ug/l	Basic Standards - Water + Fish, SSS
Phenol	10,220 acute, 2560 chronic	ug/l	Basic Standards - Aquatic Life
Pyrene (PAH)	0 0028	ug/l	Basic Standards - Water + Fish, SSS
Simazine	4 0	ug/l	Site Specific Standard
Tetrachlorobenzene 1,2,4-5	2	ug/l	Basic Standards - Water Supply
Tetrachloroethane 1,1,2,2	0 17	ug/l	Basic Standards - Water + Fish, SSS
Tetrachloroethylene	0 8	ug/l	Basic Standards - Water + Fish, SSS
Toluene	1000	ug/l	Basic Standards - Water + Fish
Toxaphene	0 0002 chronic	ug/l	Basic Standards - Aquatic Life, SSS
Trichloroethane 1,1,1	200	ug/l	Basic Standards - Water + Fish
Trichloroethane 1,1,2	0 6	ug/l	Basic Standards - Water + Fish, SSS
Trichloroethylene	2 7	ug/l	Basic Standards - Water + Fish
Trichlorophenol 2,4,6	2	ug/l	Basic Standards - Water + Fish, SSS
Trichlorophenoxypropionic acid	50	ug/l	Basic Standards - Water Supply
Vinyl chloride	2	ug/l	Basic Standards - Water + Fish

**Table 2-2: Non-rad Standards for Segment 5 (Area 2)**

<i>Parameter</i>	<i>Standard</i>	<i>Units</i>	<i>Rationale</i>
<b>INORGANICS</b>			
Ammonia, unionized	none		
Boron	0.75	mg/l	Segment 5 specific - agriculture
Chlorine	0.011	mg/l	Segment 5 specific - aquatic life
Cyanide	0.005	mg/l	Segment 5 specific - aquatic life
Nitrite	maximum allowable concentration (MAC)	mg/l	to be protective of 0.5 at terminal pond outfall
Nitrate	MAC	mg/l	to be protective of 10.0 at terminal pond outfall
Sulfide	0.002	mg/l	Segment 5 specific
<b>METALS*</b>			
Arsenic, total recoverable	50	ug/l	Segment 5 specific
Beryllium, dissolved	4	ug/l	Segment 5 specific
Cadmium, dissolved	14.4 acute, 1.5 chronic	ug/l	Segment 5 specific - TVS
Chrome III, total recoverable	50	ug/l	Segment 5 specific
Chrome IV, dissolved	16 acute, 11 chronic	ug/l	Segment 5 specific - TVS
Copper, total recoverable	23	ug/l	Segment 5 Temporary Modification
Iron, total recoverable	13200	ug/l	Segment 5 Temporary Modification
Iron, dissolved	300	ug/l	Segment 5 specific
Lead, total recoverable	28	ug/l	Segment 5 Temporary Modification
Manganese, total recoverable	1000	ug/l	Segment 5 specific
Manganese, dissolved	560	ug/l	Segment 5 Temporary Modification
Mercury, total	0.01	ug/l	Segment 5 specific
Nickel, dissolved	1191 acute, 123 chronic	ug/l	Segment 5 specific - TVS
Selenium, total recoverable	10	ug/l	Segment 5 specific
Silver, dissolved	3.6 acute, 0.57 chronic	ug/l	Segment 5 specific - TVS
Zinc, total recoverable	350	ug/l	Segment 5 Temporary Modification
* for metals based on TVS (Table Value Standard), a hardness value of 140 mg/l was used			

**Table 2-2 (cont'd): Non-rad Standards - Segment 5 (Area 2 )**

ORGANICS			
Organics for Segment 5 will be based on establishing a Maximum Allowable Concentration (MAC) which will be protective of the outfall to Segment 4. The most restrictive standard for Segment 4 will be used in a mass balance calculation to determine the upstream, i.e. Segment 5, MAC.			
Carbon tetrachloride	18	ug/l	Site specific temporary modification
Tetrachloroethane 1,1,2,2	76	ug/l	Site specific temporary modification
Trichloroethylene	66	ug/l	Site specific temporary modification

### 3.0 K-H, RMRS, DOE RFFO DRAFT GROUNDWATER PROPOSAL

3 1 The following proposal was derived from discussions at the action standards working group meetings and the single text prepared by CDPHE. This strategy is intended to prevent contamination of surface water. As volatile organics are the constituents in groundwater that can impact surface water, the action levels are limited to these. Action levels are proposed to protect surface water depending on the contaminant concentrations and location within a plume. Groundwater standards will be the same as [MCLs]

3 2 Action levels will be protective of surface water uses and quality as well as ecological resources. As stated in the Conceptual Vision, domestic use of groundwater will be prevented through institutional controls. Since no other human exposure to groundwater is foreseen, groundwater action levels are not based upon human health protection.

3 3 There will be a two phased approach to the application of standards and triggering of actions dependent on contaminant concentrations, and locations within a plume. In addition, the current, agreed upon, groundwater monitoring network will be fully utilized to determine the configuration of the contaminant plumes and changes in hydrologic conditions. The two phases are as follows:

Phase 1 - Action levels of 100 X MCLs will trigger remediation or management actions where appropriate.

Phase 2 - Exceedances at Performance Monitoring wells located downgradient of plumes will trigger a different sequence of actions including evaluation and remediation where appropriate.

3 4 Phase 1 Concentrations above 100 X MCLs  
Where these action levels are exceeded in wells, this will define the high contaminant concentration source areas for plumes. Actions triggered when these levels are exceeded will be to conduct an evaluation to determine if remedial or management action is necessary to prevent groundwater from reaching surface water. This evaluation will determine if an action is necessary by ascertaining if:  
- a pathway evaluation indicates that surface water will be impacted,  
- an effective groundwater remediation is possible, and  
- there is no decreasing trend in groundwater over two years after source removals have occurred.

A If this evaluation indicates that an remedial action is required, then the type and location of an effective, cost-efficient and feasible groundwater remedial actions

will be delineated and implemented in accordance with the Environmental Priority List. Plumes which do not exceed Phase 1 trigger levels may also be considered as candidates for remediation if these pose a significant risk to surface water.

- B Effective, cost-efficient and feasible groundwater remedial actions may be taken at locations within the plume. Factors contributing to taking action within plumes includes technical impracticability at the plume edge, topographic or ecological problems at the plume edge. All parties recognize that this situation may result in a portion of a plume not being remediated or managed. This plume may result in surface water impacts for some time.
- C When an upgradient action is taken which results in abandoning a portion of a plume, DOE RFFO may request relief from groundwater and surface water standards. CDPHE and EPA will evaluate the request and may grant temporary relief or alternate concentration limits. Soil or subsurface soil removals will not be considered as the sole justification for alternate concentration limits.
- D Groundwater plumes that are stationary and do not, therefore, present a risk to surface water, regardless of their contaminant levels, will not require remediation or management. They will require continued monitoring to demonstrate that these are remaining stationary.

- 3.5 Phase 2 Performance Monitoring wells located downgradient of plumes will trigger a different set of actions. Where practical, these wells are located between the downgradient edge of each plume and the surface water towards which the plume is most directly migrating. These wells have been chosen by all parties and are currently uncontaminated. A list of these wells is attached and includes a few new wells. If these new wells are shown to be contaminated, new locations for uncontaminated wells will be selected downgradient of the plume boundary.

If contaminants consistently exceed standards at these wells, additional evaluation will be performed to determine if a remedial action is appropriate or required. If no increase in contamination is observed, and if the groundwater source is removed, these plumes will be left to naturally attenuate.

- 3.6 Groundwater Monitoring Network
- The groundwater monitoring network will continue to operate as recently modified, unless subsequent changes are agreed to by all parties. Changes in hydrologic conditions and exceedances of groundwater standards will be reported quarterly and summarized annually to all parties. During the quarterly evaluations, if previously uncontaminated wells are shown to be contaminated, the sampling frequency will be increased to monthly. Three consecutive monthly samples showing exceedances will trigger an evaluation to determine if a remedial or management action is necessary. Analyte suites, frequency and specific

monitoring locations will be evaluated annually to adjust to changing hydrologic conditions including plume migration

Groundwater remedies and some soil remedies will continue to be monitored using the existing groundwater monitoring network. Requirements for monitoring will be decided on a case by case basis.